Collaborative Wire Harness Design in PLM Environment

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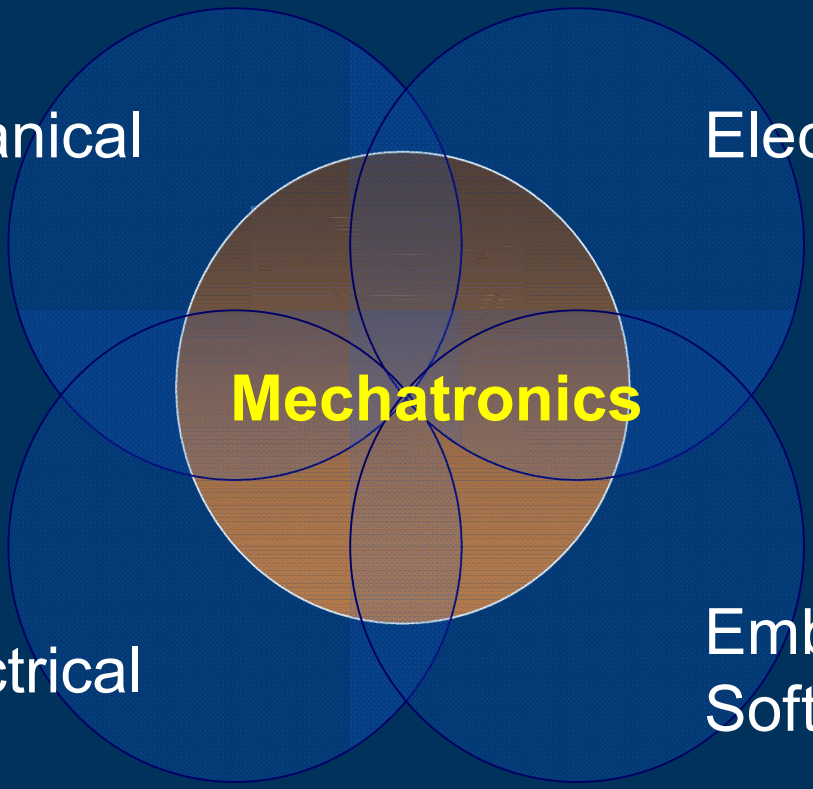
Agenda

- Mechatronics overview
- Wire Harness Design Challenges
- Collaborative Framework
- Use cases

Mechatronics Definition

- A mechatronics system is the synergistic integration of mechanical, electrical, electronics and embedded software technologies into electro-mechanical products.



Some Facts…

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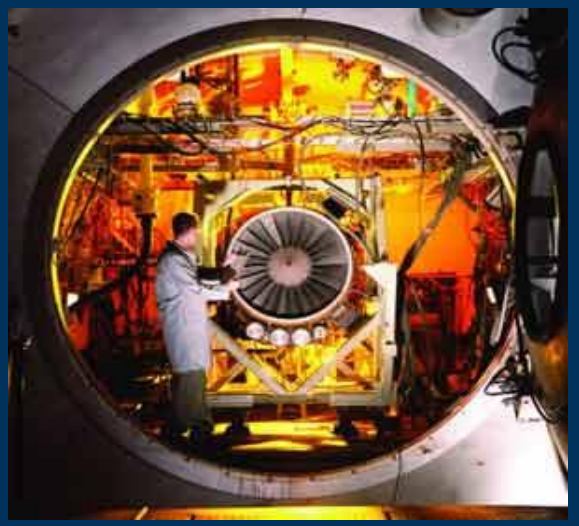
- Rapidly Increasing Functionality
  - Increased package and PCB density
  - 80-90% of new functions are electronics based[1]
  - Rapidly changing technology
  - Increased on-board diagnostics
  - Software-based functionality
- Growing Networks
  - Hundreds of kilometers of wires in an aircraft
  - Complex interconnections
- Tighter Physical Constraints
  - Smaller enclosures
  - Increased number of components
  - Electromagnetic interference
  - Non-planar, flexible circuitry



Sources:
[1]Steiner & Schmidt
[2]Hoffman & Turner
[3]Romeo & Marelli

Mechatronics Design Environment

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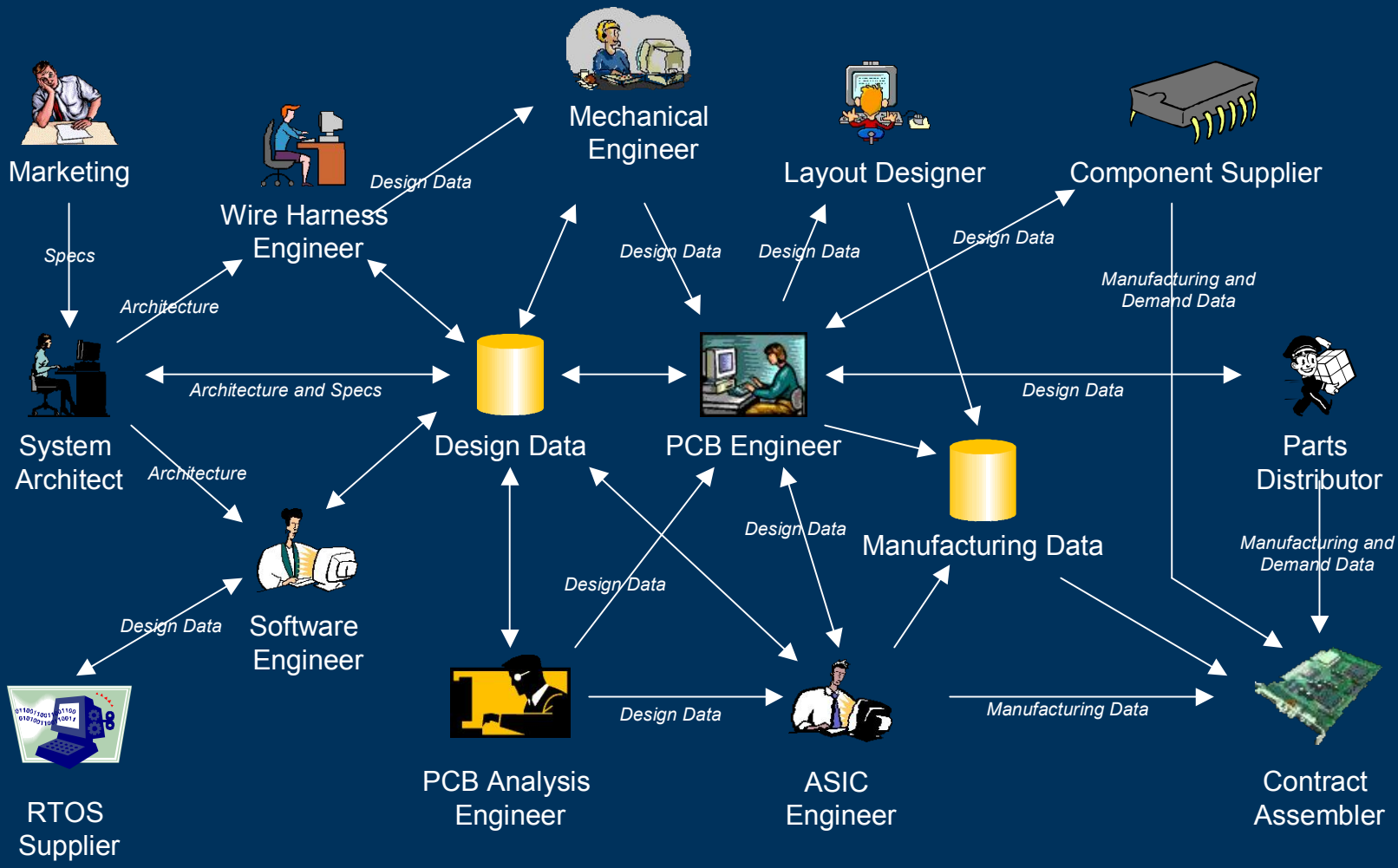

Challenges

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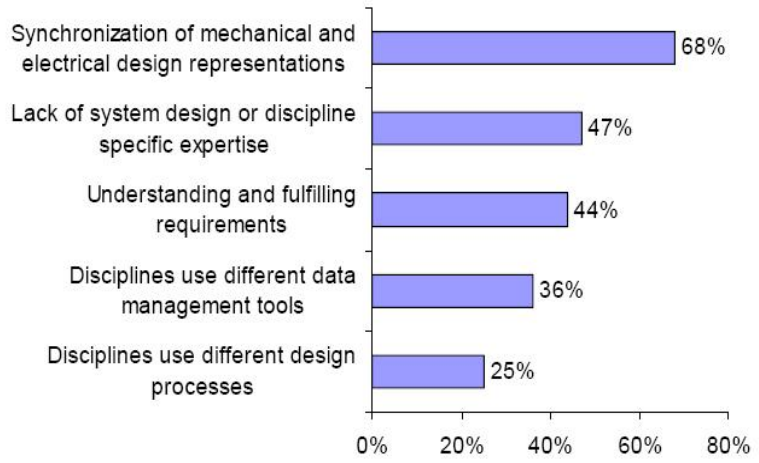
Figure 2: Mechatronic Product Development Challenges



Source: AberdeenGroup, August 2006

- Synchronization **of mechanical and electrical design representations**
- Lack of system design
- **Understanding and fullfilling** requirements
- **Disciplines use** different data management
- **Disciplines use** different design processes
- Lack of or no smooth flow of data across all phases

Significant Challenge → **Significant Value**

Objective

- Mechatronics overview
- Wire Harness Design Challenges
- Framework
- Use cases

Wire Harness design focus…

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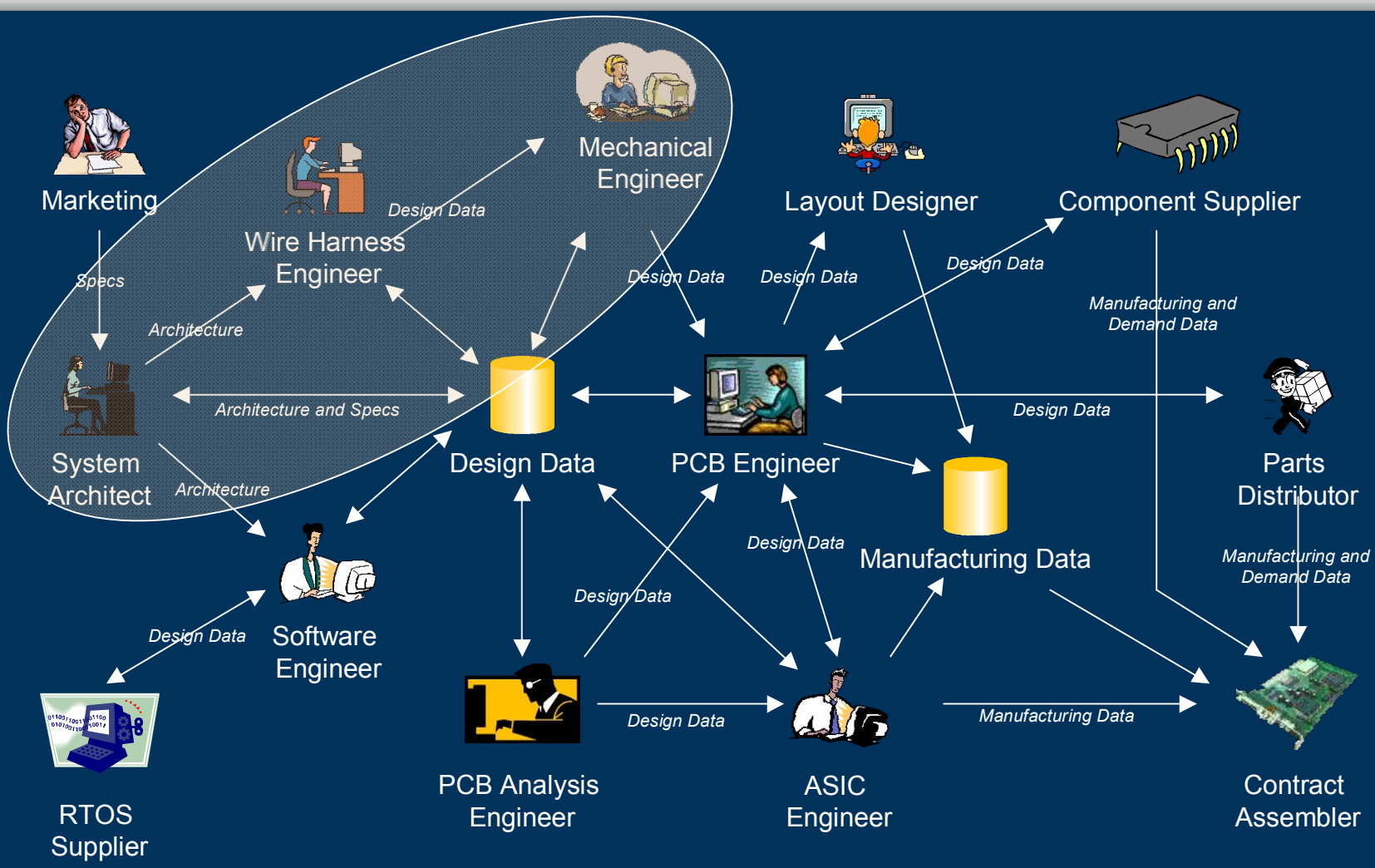


Challenges associated with Wire Harness Design Process…

- Developers designed and located each sub-assembly in the system with little consideration of the physical and electrical constraints of cabling
- Determine precise routing and length of cable through trial and error
- Synchronization of mechanical and electrical design data
- Lack of Interoperability between tools
- Disciplines use different data management
- Disciplines use different design processes
- Lack of or no smooth flow of data across all phases
- Lack of Change control
- Lack of support for Option and Variant management of Max complexity wire harness

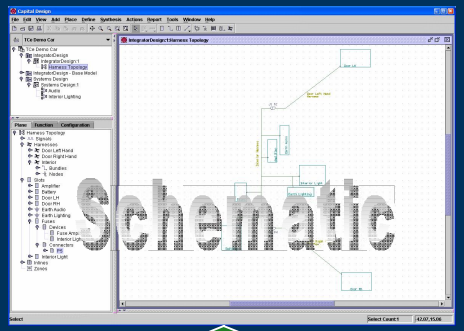
Evolution of Wire Harness Design

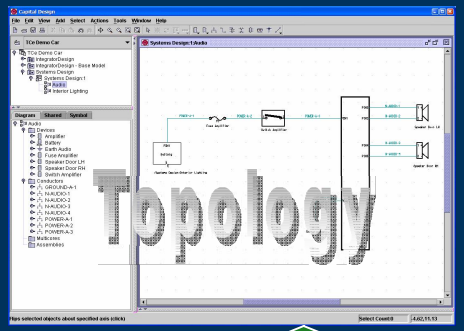
- Some of the challenges are addressed by integrating ECAD system with Mechanical 3-D modeling system

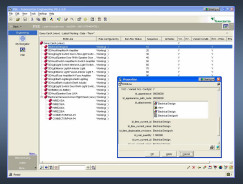
- Precise Routing
- Exact length of Cable & Bundle data
- Interference checks
- Design Rule Validation

- Lack of integrated workflow resulting
  - Duplication of design data
  - Modification of data is error prone and time consuming.
- Lack of change control
- Point to point integration between multiple design tools

Vision of Harness Design







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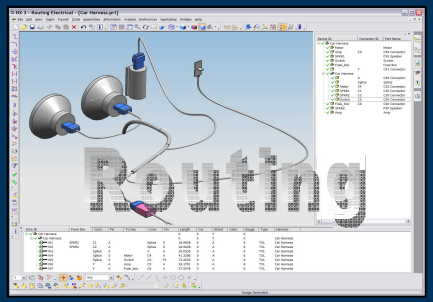

Teamcenter PLM

- Core Capabilities
  - Security
  - Change Management
  - Configuration Management
  - Data Distribution
  - Workflow
  - Collaboration
- Wire Harness Design
  - AP212/KBL data model
  - PLM XML support
  - ITK, AIWS API support
  - Integration framework

Objective

- Mechatronics overview
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UGS Mechatronics Framework

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1 Mecha Req.

2 Mecha Sys. Eng.

3 Source Code Lifecycle

4 ESM-Binary Lifecycle

5 PCB Lifecycle

6 Wire Harness Lifecycle

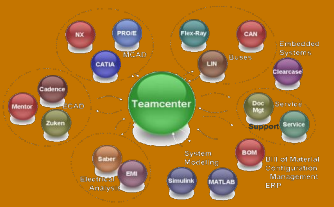
7 Mecha. Simulation

8 Elc. Mfg.

9 Service & Diag.

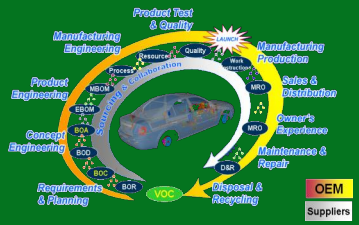
Supported Standards
STEP AP 214
STEP AP 210
STEP AP 212
STEP AP 233
PLM XML
JT

Mechatronics Data Model

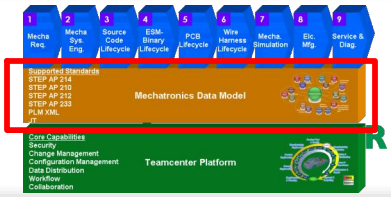


Core Capabilities
Security
Change Management
Configuration Management
Data Distribution
Workflow
Collaboration

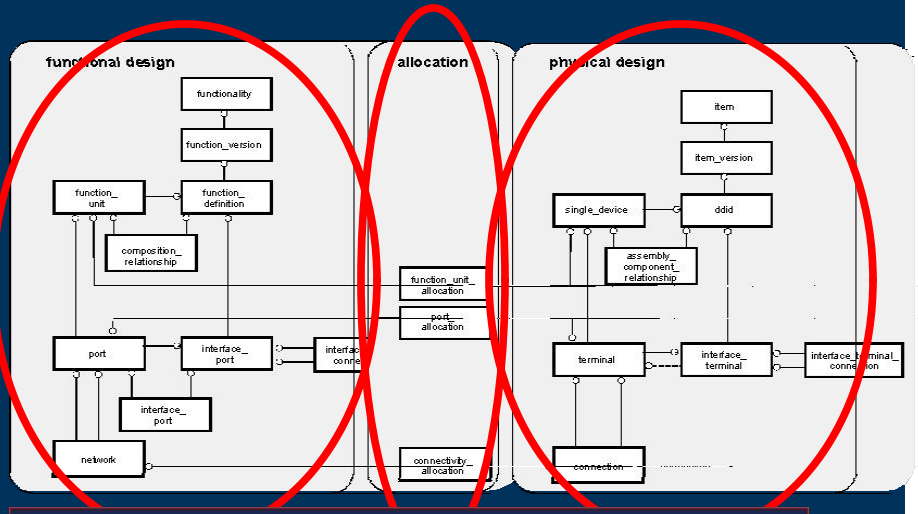
Teamcenter Platform

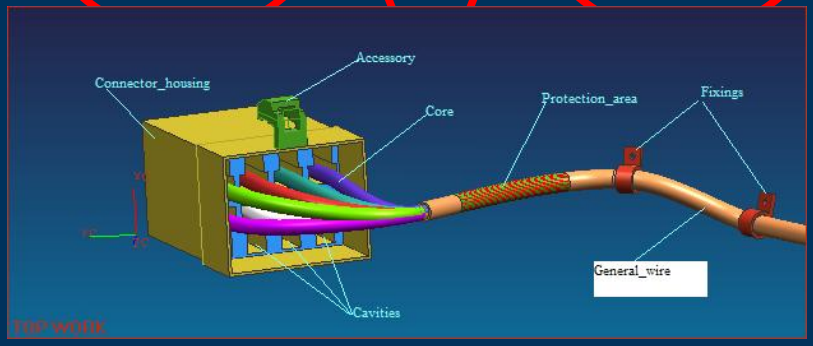


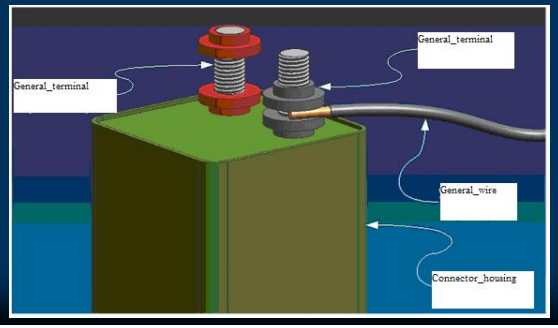
Wire Harness Data Model

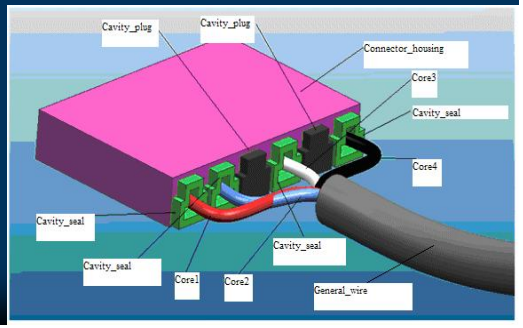


- Data model based on Industry standard STEP model – AP212
- Provide objects to support entire design process –
  - Functions, Connections, Signals, Ports, Routing, Topology etc for Logical Design
  - Items, Devices for Physical Design
- Allocations to associate components across different phases of development
- Optionally, support KBL specific data elements - general_wire, general_terminal, cavity_plug, cavity_seal

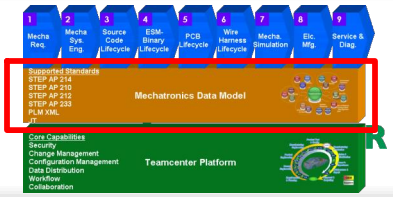






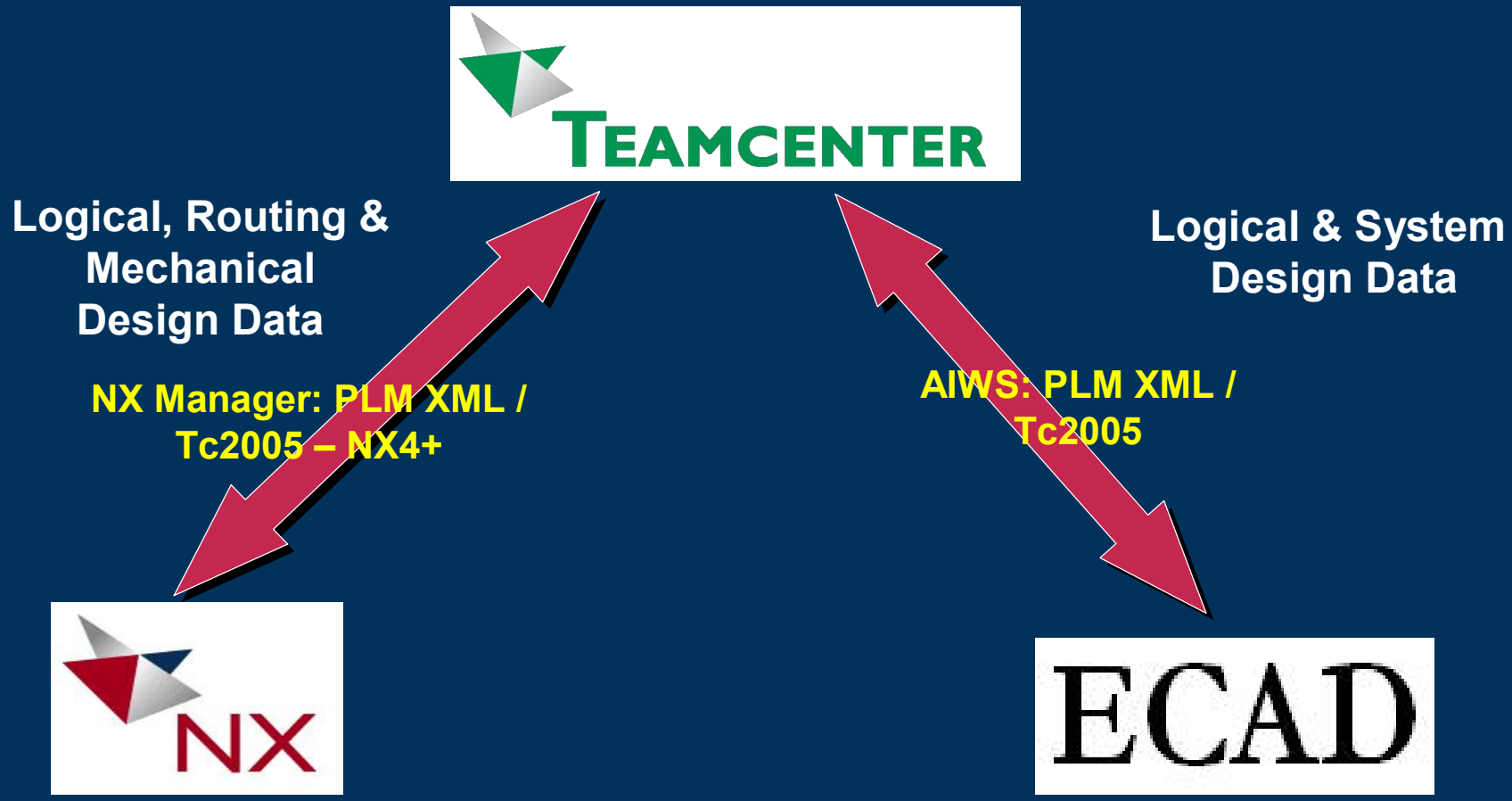


Wire Harness Data Model contd…



- Goal is to integrate the design environment so data can be shared seamlessly between different application environments

Integration Architecture



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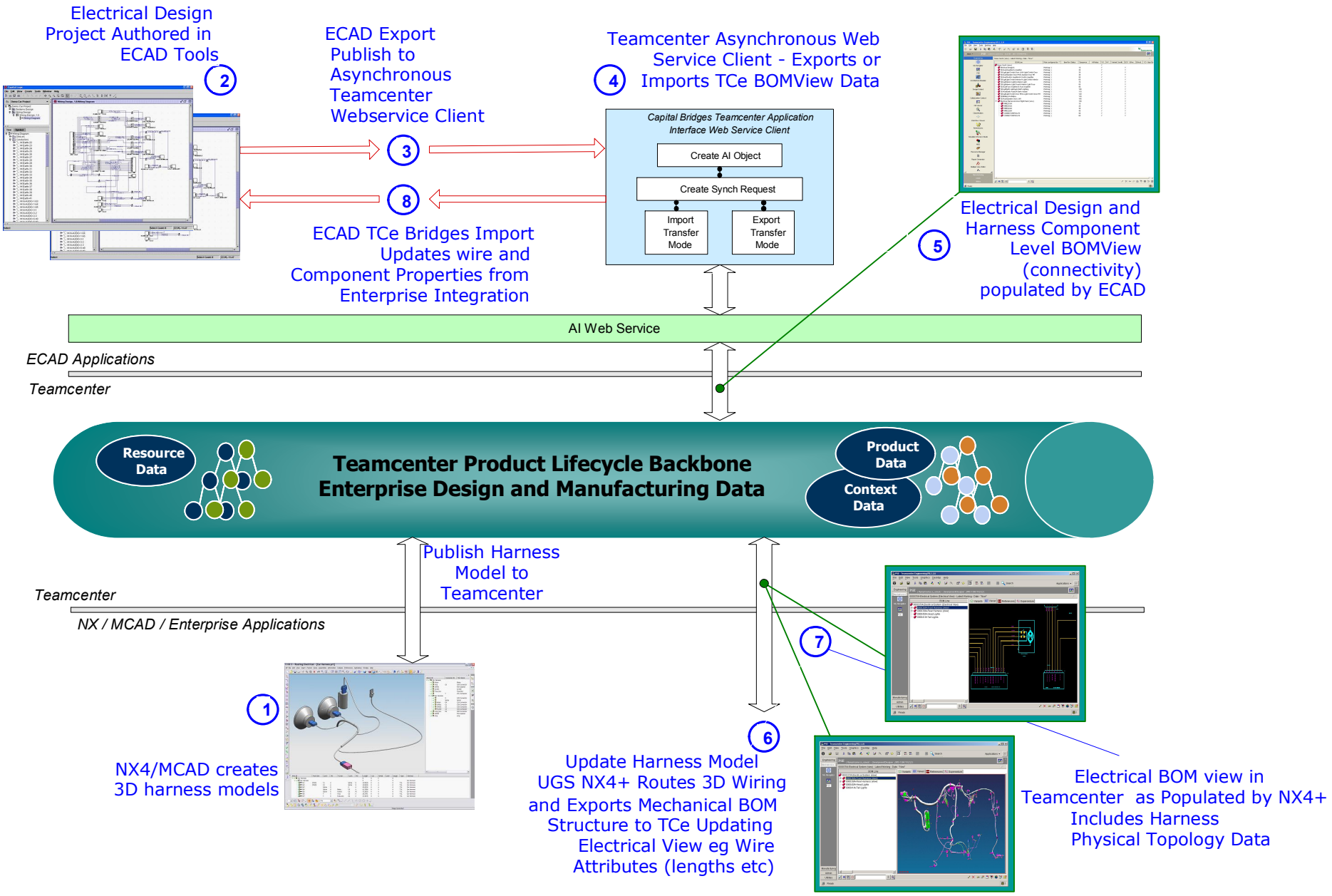

Use Case – Wiring Design and Release

Summary

- Better Integration between 2-D schematic and 3-D Mechanical systems
- Integration provides the ability to design in context
- Unique master data in Teamcenter shared across all stages of design
- Ability to manage workflow and change control

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Transforming the process of innovation

Thank you

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